

WHAT IS CLAIMED IS:

1 1. A method for determining the frequency of current ripples
2 contained in the armature current signal of a commutated direct current (DC) motor,
3 the method comprising:
4 determining a frequency spectral result of the armature current signal;
5 determining a frequency spectral result of an electric operating
6 parameter of the motor;
7 subtracting the frequency spectral result of the armature current signal
8 and the frequency spectra result of the motor electric operating parameter from one
9 another to determine the frequency spectral result of the current ripples contained
10 in the armature current signal; and
11 determining current ripple frequency from the frequency spectral
12 result of the current ripples contained in the armature current signal.

1 2. The method of claim 1 wherein the armature current signal is
2 an analog armature current signal, the method further comprising:
3 digitizing the analog armature current signal;
4 wherein determining the frequency spectral result of the armature
5 current signal includes determining the frequency spectral result of the digitized
6 armature current signal.

1 3. The method of claim 1 wherein:
2 determining the frequency spectral results of the armature current
3 signal and the motor electric operating parameter includes using a fast Fourier
4 transform on the armature current signal and the motor electric operating parameter
5 to determine the frequency spectral results of the armature current signal and the
6 motor electric operating parameter.

1 4. The method of claim 1 wherein:
2 the motor electric operating parameter is the armature voltage signal.

1 5. The method of claim 1 wherein:

2 the motor electric operating parameter is the armature current signal
3 at a different motor operating state than the motor operating state of the armature
4 current signal used in the step of determining the frequency spectral result of the
5 armature current signal.

1 6. The method of claim 1 wherein:
2 the current ripple frequency is determined during a start-up phase of
3 the motor.

1 7. The method of claim 1 further comprising:
2 determining rotational speed of a drive shaft of the motor based on
3 the current ripple frequency; and
4 determining rotational position of the drive shaft based on the
5 rotational speed of the drive shaft.

1 8. The method of claim 7 wherein the armature current signal is
2 an analog armature current signal, the method further comprising:
3 digitizing the analog armature current signal;
4 wherein each step is performed at each point in time of the digital
5 sampling of the analog armature current signal.

1 9. The method of claim 7 further comprising:
2 monitoring the current ripple frequency for changes during the
3 operation of the motor.

1 10. The method of claim 9 further comprising:
2 counting the current ripples contained in the armature current signal;
3 and
4 modifying the number of counted current ripples as a function of a
5 change in the current ripple frequency during the operation of the motor.